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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/060,825	04/16/1998	ROBERT BRENNAN	10494-10	1023
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H SAMUEL FROST BERESKIN & PARR BOX 401 40 KING STREET WEST TORONTO, ON M5H 3Y2 CANADA		EXAMINER TRAN, CON P		
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Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

**Application No.**

09/060,825

**Applicant(s)**

BRENNAN, ROBERT

**Examiner**

Con P. Tran

**Art Unit**

2644

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 25 February 2004.  
2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.  
3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-33 is/are pending in the application.  
4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.  
5) ☒ Claim(s) 1-20 and 31-33 is/are allowed.  
6) ☒ Claim(s) 21-24 and 27-29 is/are rejected.  
7) ☒ Claim(s) 30 is/are objected to.  
8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.  
10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).  
11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
a) ☐ All b) ☐ Some \* c) ☐ None of:  
1. ☐ Certified copies of the priority documents have been received.  
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.  
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).  
\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)  
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)  
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_.  
4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date \_\_\_\_\_.  
5) ☐ Notice of Informal Patent Application (PTO-152)  
6) ☐ Other: \_\_\_\_\_

## DETAILED ACTION

### *Claim Rejections - 35 USC § 102*

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this

Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. **Claims 21-22, and 27, and 29** are rejected under 35 U.S.C. 102(b) as being anticipated by Lindemann et al. (5,479,522, hereinafter, "Lindemann").

Regarding **claim 21**, Lindemann teaches an apparatus (see Fig. 11 and respective portions of the specification), for reducing noise in an input signal (LEFT IN col.12, lines 62-67), the apparatus including an input for receiving the input signal, the apparatus comprising:

(a) a compression circuit (266) for receiving a compression control signal and generating an amplification control signal (for multiplier 268 col.12, lines 62-67) in response;

(b) an amplification unit (multiplier 268) for receiving the input signal and the amplification control signal and generating an output signal (LEFT OUT) with compression and reduced noise (col. 12, lines 12-61); and,

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(c) an auxiliary noise reduction unit (260, 262, 264) connected to the input for generating an auxiliary noise reduced signal (to compression gain 266), the compression control signal being the auxiliary noise reduced signal (col. 12, lines 12-61).

Regarding **claim 27**, Lindemann et al. further teaches an apparatus as claimed in claim 21, wherein the apparatus further comprises a main noise reduction unit (265, left gain vectors, window 250, FFT 254, Figs. 4, 11) connected to the input (LEFT IN) for generating a noise reduced signal and supplying the noise reduced signal to the amplification unit (268) in place of the input signal (col. 12, lines 12-17, and lines 55-61).

Regarding **claim 29**, Lindemann et al. teaches an apparatus as claimed in claim 27. Lindemann et al. does not explicitly disclose wherein the auxiliary noise reduction unit is different from the main noise reduction unit. However, it is obvious for the separating the auxiliary noise reduction unit from the main noise reduction unit. Therefore, it would have been obvious to one of the ordinary skill in the art at the time the invention was made to incorporate such teaching for purpose of being easy to repair.

Regarding **claim 22**, Lindemann et al. further teaches an apparatus as claimed in claim 27, wherein the input signal contains speech and the main noise

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reduction unit (see Fig. 1, 4, 7, 11, and respective portions of the specification) comprises:

(1) a detector (microphone 16) connected to said input and providing a detection signal indicative of the presence of speech (col. 3, lines 51-58);

(2) magnitude means (sum MAGSQ 154) for determining the magnitude spectrum of the input signal  $|X(f)|$ , with both the detector and the magnitude means being connected to the input of the apparatus (col. 8, lines 26-57);

(3) spectral estimate means (beam spectrum subtract gain 158, Fig. 4) for generating a noise magnitude spectral estimate  $|N^*(f)|$  and being connected to the detector and to the input of the apparatus (col. 9, lines 50-65);

(4) a noise filter calculation unit (160, 162, Fig. 7) connected to the spectral estimate means and the magnitude means, for receiving the noise magnitude spectral estimate  $|N^*(f)|$  and magnitude spectrum of the input signal  $|X(f)|$  and calculating an attenuation function  $H(f)$ ; col. 9, line 50 – col. 10, line 20; col. 12, lines 35-54); and,

(5) a multiplication unit (202, Fig. 4) coupled to the noise filter calculation unit and the input signal for producing the noise reduced signal (col. 11, lines 22-29).

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3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. **Claims 21, 27-28** are rejected under 35 U.S.C. 103(a) as being unpatentable over Salmi et al. (5,903,655, hereinafter, "Salmi").

Regarding **claims 21, 27-28**, Salmi teaches a hearing aid system (see Fig. 1, 8, and respective portions of the specification), for reducing noise in an input signal (by band pass filters which only let signals in selected frequency band through, reducing unwanted signals i.e., noise; Fig. 8; col. 7, lines 34-37), the hearing aid system including an input for receiving the input signal, the hearing aid system comprising:

(a) a compression circuit (48) for receiving a compression control signal and generating an amplification control signal (volume control 18 for output amplifier 20, col. 5, lines 4-26; col. 12, lines 12, lines 62-67) in response;

(b) an amplification unit (output amplifier 20) for receiving the input signal and the amplification control signal and generating an output signal (to speaker 22) with compression and reduced noise (through band pass filter 44, Fig. 8; col. 7, lines 34-37); and,

(c) an auxiliary noise reduction unit (band pass filter 44, the band pass filters which only let signals in selected frequency band through, reducing

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unwanted signals i.e., noise; Fig. 8; col. 7, lines 34-37) connected to the input (microphone 12) for generating an auxiliary noise reduced signal (output of band pass filter), the compression control signal being the auxiliary noise reduced signal (col. 7, lines 34-55).

wherein the apparatus further comprises a main noise reduction unit (band pass filter 42, the band pass filters which only let signals in selected frequency band through, reducing unwanted signals i.e., noise; Fig. 8; col. 7, lines 34-37) connected to the input (microphone 12) for generating a noise reduced signal and supplying the noise reduced signal to the amplification unit (output amplifier 20) in place of the input signal; the main noise reduction unit (band pass filter 42) and the auxiliary noise reduction unit (band pass filter 44) employ the same noise reduction filtering.

However, Salmi does not explicitly disclose the noise reduction filtering using algorithm in noise reduction. It would have been obvious to one of ordinary skill in the art at the time the invention was made to employ algorithm for purpose of ease of implementation.

5. **Claims 23-24** are rejected under 35 U.S.C. 103(a) as being unpatentable over Lindemann et al. (5,479,522, hereinafter, "Lindemann") in view of Händel (PCT WO 96/24128).

Regarding **claim 23**, Lindemann et al. teaches an apparatus as claimed in claim 22. Lindemann et al. further teaches a frequency transform means (FFT,

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see Fig. 1B, 11, and respective portions of the specification) connected between said input (LEFT IN) and both of the magnitude means (sum MAGSQ 154) and the spectral estimate means (beam spectrum subtract gain 158, Fig. 4; col. 9, lines 50-65) for transforming the signal into the frequency domain to provide a transformed signal ( $X(f)$ ) wherein the magnitude means determines the magnitude spectrum ( $|X(f)|$ ) from the transformed signal ( $X(f)$ ; col. 8, lines 26-57), and wherein the spectral estimate means determines the noise spectral estimate ( $|N|(f)$ ), the apparatus further including inverse frequency transform means ( $FFT^{-1}$ ) for receiving a transformed noise reduced signal from the multiplication unit, the inverse frequency transform means providing the noise reduced signal (col. 12, line 35 – col. 13, line 10).

However, Lindemann et al. does not explicitly disclose wherein the spectral estimate means determines the noise spectral estimate ( $|N|(f)$ ) from the transformed signal ( $X(f)$ ) in the absence of speech.

Händel teaches reducing noise (see page 2, lines 10-12) in an input, the input signal containing speech (see page 2, lines 3-6), and having a signal to noise ratio (SNR; see page 16, lines 5-6; Fig. 1 and Fig. 7); in the absence of speech (see page 5, lines 13-15), determining a noise magnitude spectral estimate ( $|N^*(f)|$ , 140, see Fig. 7).

Therefore, it would have been obvious to one of ordinary skill in the art, at the time the invention was made to incorporate Händel teaching with Lindemann et al. in order to provide a better noise reduction without sacrificing audible quality, as suggested by Händel in page 2, lines 12-13.



Regarding **claim 24**, Händel further discloses a spectrum subtraction wherein (see page 7, Table 2, line 8) the attenuation function means (24, Fig. 1) calculates the auxiliary signal as an attenuation function because the method attenuation function with an oversubtraction factor and an attenuation rule gives a better noise reduction without sacrificing audible quality (see page 2, lines 12-13). Händel further discloses the equation:

$$H(f) = \{ ( |X(f)|^2 - \beta |N^{\wedge}(f)|^2 ) / |X(f)|^2 \}^{\alpha}$$

Where:  $H(f) = \hat{H}_{\delta PS}(w)$  , attenuation function (see page 7, line 2-3)

$X(f) = \Phi^{\wedge}_x(w)$  , magnitude spectrum of the input audio signal

(see page 3, line 26-27)

$N^{\wedge}(f) = \Phi^{\wedge}_v(w)$  , noise magnitude spectral estimate

(see page 4, line 3-4)

$\beta = \delta$  , oversubtraction factor (see page 26, lines 6-7)

$\alpha = 1/2$  , an attenuation rule

wherein  $\alpha$  and  $\beta$  are selected to give a desired attenuation function.

### ***Allowable Subject Matter***

6. **Claims 1-20, 25-26, 31-33** are allowed.

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7. **Claim 30** is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The following is a statement of reasons for the indication of allowable subject matter:

Regarding **claims 1, 30, 31, 32, and 33**, the cited prior art provided numerous examples of different noise reduction methods but failed to disclose or fairly suggest the specific functional limitation "*wherein there is no substantial modification to the input signal for very low and for very high signal to noise ratios*" as specify in claim.

**Claims 2-20, and 25-26** are allowable by virtue of their dependency on claim 1.

### ***Response to Arguments***

8. Applicant's arguments with respect to claims 21-24, and 27-30 have been considered but they are moot in view of the new grounds of rejection.

9. Applicant asserts on pages 12-13, regarding claim 21:

"Firstly, Lindemann teaches the use of two input signals (LEFT IN and RIGHT IN) whereas the Applicant claims a single input signal. Secondly, Lindemann teaches that the combination of the LEFT

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and RIGHT inputs (see summing block 258) is provided to the MAG SQUARED BLOCK (260), the N BAND SUM block (262) and the smoothing filter (264) block whereas the Applicant claims that a single input signal is provided to an auxiliary noise reduction unit. In addition, the LEFT input signal is not directly provided to the multiplier block (265) in the Lindemann reference. Rather Lindemann teaches using a frequency response adjustment vector (LEFT GAIN) to modify the input signal whereas the Applicant claims that the input signal is provided to the amplification unit. . . .from a single input signal. . . . It is clearly evident that the power estimate will contain both signal and noise components"

Examiner respectfully disagrees. Since claim 21 is an open-ended claim, it does not exclude other input signal, or other modification of a claimed input signal.

10. Applicant asserts on page 14, regarding claim 27:

" . . . Accordingly, the Applicant submits that the SNR in the frequency bands of interest is not improved. Consequently, the LEFT GAIN vector can not be perceived to be a noise reduction unit as claimed by the Applicant in claim 27."

Examiner respectfully disagrees. As presented in the Office Action, since the binaural compression follows the noise reduction stage, the windowing and FFTs will already have been performed by the noise reduction stage (col. 12, lines 12-17). In addition, the LEFT GAIN is frequency response adjustment vector to equalize FFT vector, specifically based on each user, therefore LEFT GAIN also contributes to noise reduction (col. 12, lines 43-61).

***Conclusion***

11. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Con P. Tran, whose telephone number is (703) 305-2341. The examiner can normally be reached on M - F (8:30 AM - 5:00 PM).

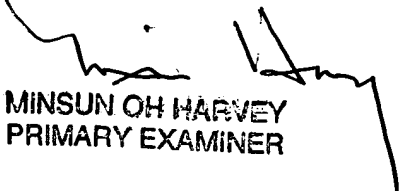
If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Forester W. Isen can be reached on (703) 305-4386. The

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fax phone numbers for the organization where this application or proceeding is assigned are (703) 872-9314 for regular communications and (703) 872-9314 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the Customer Service Office at telephone number (703) 306-0377.

cpt CPJ  
April 30, 2004



MINSUN OH HARVEY  
PRIMARY EXAMINER